

### **REMARKS/ARGUMENTS**

Reconsideration and allowance of the present application based on the following remarks are respectfully requested.

Claims 9-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 2,696,475 ("Farrow") or U.S. Patent 3,397,154 ("Talsma") or U.S. Patent 4,493,906 ("Couvillion").

Preliminarily, the Examiner relies on claims 1-2 (col. 12, line 5-27) of Talsma to support the obviousness rejection of the present invention. However, Applicant submits that the compositions taught in Talsma comprise an *alpha*-alumina support, not a transition-alumina.<sup>1</sup> Moreover, since the alumina support employed in the present invention is a transition-alumina – not an *alpha*-alumina as in Talsma – and since it is known that the properties of transition-alumina are different than *alpha*-alumina, the resulting compositions comprising said different supports must also be different. Accordingly, such differences in composition renders the obviousness rejection over Talsma moot.

The Examiner asserts that Farrow or Couvillion render the compositions of the present invention obvious because "selected individual components" have overlapping ranges to those found in the present invention. After a careful study of these references, neither of them teach a process of impregnating porous transition alumina with an aqueous solution of a copper ammine carbonate complex as in the present invention. It is well known that the process used to prepare catalyst compositions significantly impacts the activity of the catalyst produced. In fact, an appreciation of this understanding is further supported in Farrow.<sup>2</sup> Thus, as both of these references utilize a different process than that of the present invention, the Applicant submits that the base assumption for the asserted *prima facie* case of obviousness lacks support.

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<sup>1</sup> See Kirk-Othmer, Encyclopedia of Chemical Technology, Volume 2, Second Edition, page 48:

**Transition Forms of Alumina:** "This name applies to intermediate forms of alumina encountered during the thermal decomposition of crystallized hydrates – and sometimes during that of other aluminum compounds – before the appearance of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, which constitutes the stable phase above 1100 °C."

<sup>2</sup> The metals may be used in many different forms, but it is important that the surface area be great, and in active condition. Therefore, the steps used in preparing the catalyst greatly affect the activity of the finished product. (See Farrow, col. 1, line 30-35, emphasis added).

Interestingly, Farrow does not demonstrate the preparation of a copper catalyst, but *mistakenly assumes* that the processes used in the preparation of a nickel catalyst will “translate” to a copper catalyst species. Applicant directs the Examiner’s attention to the pending application, where this “translation assumption” - using the Farrow method -- is refuted (See page 1, line 24 – page 2, line 17, with special attention to page 2, lines 12-17). Specifically, the complex constants of copper differ significantly from that of cobalt and nickel, which lead to different behavior in formation of the carbonate complex when reacted with the carbon dioxide. Turning to Couvillion, it is well known that low surface area of reduced copper results when gamma-transition alumina is impregnated, especially when higher copper loadings are utilized (See page 5, lines 1-9 of pending application).

Unlike the present invention, both Farrow and Couvillion employ ammonium metal salts of strong acids (e.g., copper nitrate) to impregnate the support. An additional step is then required (e.g., streaming carbon dioxide) to convert the ammonium metal salt into a carbonate complex. As acknowledged in Farrow, when the resulting compositions are then heated to remove the ammonia, the liberated free strong acid produced from the reaction of the metal salts with the carbon dioxide can react with the desired metal carbonate, thereby detrimentally altering the catalyst compositions produced by said process. Accordingly, as the processes utilized, and consequently the compositions they produce, are different in Farrow and Couvillion than that of the present invention, the asserted *prima facie* case of obviousness lacks support.

Therefore, all objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Should any issues remain unresolved, the Examiner is encouraged to contact the undersigned attorney for Applicants at the telephone number indicated below in order to expeditiously resolve any remaining issues.

Respectfully submitted,

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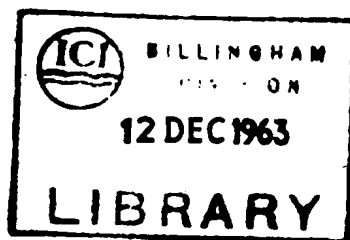
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VOLUME 2



Aluminum Compounds  
to  
Azo Dyes

form of crystals 1 to 2 mm in size, under pressures above 1000 kg/cm<sup>2</sup> (5). It has not been produced industrially and has no specific applications.

The thermal decomposition of diasporite takes place in air from 450 to 500°C upward and leads directly to a stable anhydrous alumina,  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, in the form of very fine crystals. As a result there is a very marked increase in the specific surface area, but the external shape of the original crystal is maintained. This phenomenon, called *pseudomorphosis*, is moreover a general feature of the alumina hydrates. It may also be observed with the activated or calcined Bayer hydrate.

#### QUASI-ANHYDROUS AND ANHYDROUS ALUMINAS

**Transition Forms of Alumina.** This name applies to intermediate forms of alumina encountered during the thermal decomposition of crystallized hydrates—and sometimes during that of other aluminum compounds—before the appearance of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, which constitutes the stable phase above 1100°C (see Table 3).

Table 3. Thermal and Hydrothermal Transformations of Alumina (6)

Dehydration and rehydration			Heating temperature					
			air 200°C	200–400°C	600°C	900–1000°C	1100–1200°C	
$\alpha$ -trihydrate				$\chi$		$\kappa$	$\alpha$	
		vacuum 200°C						
		rehydration 25°C			$\rho$	( $\eta$ )	$\theta$	$\alpha$
$\beta$ -trihydrate		vacuum 200°C						
		air 200°C			$\eta$	$\theta$	$\alpha$	
		rehydration 300°C						
$\alpha$ -monohydrate					$\gamma$	$\delta$	$\alpha$	
		air or vacuum 400°C						
Transition aluminas								
$\rho$	rho	amorphous	$\gamma$	gamma	cubic	$\theta$	theta	monoclinic
$\chi$	chi	cubic	$\kappa$	kappa	orthorhombic	$\delta$	delta	orthorhombic
$\eta$	eta	cubic spinel						

Six principal forms are distinguished, three of which ( $\chi$  (chi),  $\eta$  (eta), and  $\gamma$  (gamma)) are poorly crystallized, and three ( $\kappa$  (kappa),  $\theta$  (theta), and  $\delta$  (delta)) relatively well crystallized, these latter resulting from rearrangement of the former at sufficiently high temperatures, above 800°C.

There is a seventh form,  $\rho$ -alumina (rho-alumina), which may be considered amorphous (see Table 3). The designations given to the transition aluminas are those of the American (Alcoa) nomenclature now adopted by most authors. These products retain a small quantity of water of constitution, amounting to between 0 and